PBEEEP
State Government

Public Buildings Enhanced Energy Efficiency Program

SCREENING RESULTS FOR PINE TECHNICAL COLLEGE

Pine
Technical
College

April 22, 2011

Campus Overview

Pine Technical College	
Location	900 4th Street Pine City MN 55063
Facility Manager	Steve Lange
Number of Buildings	11
Interior Square Footage	98,394
PBEEEP Provider	Center for Energy and Environment (Neal Ray)
Date Visited	February 14, 2011
Annual Energy Cost (from B3)	$113,167 (2010)
Utility Company	East Central Energy-Electric Minnesota Energy Resources-Natural Gas
Site Energy Use Index (from B3)	65 kBtu/sq ft(2009)
Benchmark EUI (from B3)	154 kBtu/sq ft

Pine Technical College consists of eleven different buildings, which in reality is one continuous building with several additions over the history of the complex. It is compromised of 98,394 sq feet.

Building Name	State ID	Square Footage	Year Built
585 Hillside Avenue	E26205T1405	2,100	1971
585 Hillside Avenue	E26205T1505	2,400	1994
Class & Stu Long Ad	E26205T0278	34,374	1978
Equipment Storage	E26205T1265	600	1965
Johnson Center for Virtual Reality Center	E26205T1101	5,073	2001
Main Bldg	E26205T0165	22,500	1965
Manufacturing Technology Center	E26205T1301	3,419	2001
Phase I	E26205T0686	3,343	1986
Phase II & III	E26205T0887	20,568	1987
Phase IV	E26205T0988	817	1988
Storage Area	E26205T0787	3,200	1987

Screening Overview

The goal of screening is to select buildings where an in-depth energy investigation can be performed to identify energy savings opportunities that will generate savings with a relatively short (1 to 5 years) and certain payback. The screening of Pine Technical College was performed by the Center for Energy and Environment (CEE) with the assistance of the facility staff. A walk-through was conducted on February 14, 2011 and interviews with the facility staff were carried out to fully explore the status of the energy consuming equipment and their potential for recommissioning. This report is the result of that information.

The Pine Technical College is a 98,394 square foot (sqft) complex located in Pine City, MN. The building primarily consists of classroom space, laboratory, library, administration space, and shop space.

Recommendation for Investigation

An investigation of the energy usage and energy savings opportunities of Pine Technical College is not recommended.

There are many factors that are part of the decision to not recommending an energy investigation of Pine Technical College. Some of the characteristics that were taken into account to not recommend Pine Technical College include:

- Limited potential energy savings opportunities observed during screening phase
- The small total square footage of the complex
- School is not in session during the summer and limited savings could be found during this time.
- Inability of the automation system to trend.
- Major equipment is new and was some of it was commissioned when it was installed.
- Energy use is over 30% lower than average MnSCU campus.

Building Overview Section

Mechanical Equipment

There are a total of 4 boilers in the complex, three were just recently installed in 2008 and are used primarily for winter use. The other boiler was installed in 2002 and is smaller. This is the summer boiler primarily used to help generate domestic hot water in the summer.

There is an air cooled chiller which produces chilled water for one AHU within the complex; AHU-1 2002, the remaining units utilize DX cooling for air conditioning in the summer.

There are a total of 10 AHUs and 3 RTUs which supply ventilation air to spaces within the building. The AHUs were installed from 1988 to 2009. Of the 10 AHUs, 7 of them are from 2002 or newer.

The following table lists the key mechanical equipment at the facility.

Mechanical Equipment Summary Table	
Quantity	**Equipment Description**
10	Air Handling Units
3	Roof Top Units
4	Hot Water Boilers
1	Chiller
3	Pumps (Chilled water and Hot water)
1	Domestic Water to water HX
1	MAU
59	Variable air volume boxes

Controls and Trending

The building runs on a Johnson Controls Metasys III automation system. The system is not capable of trending and archiving trend information because the system does not contain the Metasys system extended architecture components. The system would require this package in order to trend historical data. All major equipment is currently controlled by the automation system.

Lighting

Most of the interior lighting consists of T8 32 watts. Campus lighting retro-fits have occurred to replace all existing T12 lights. The majority of the lights are controlled by light switches with approximately 10% of the lights controlled by occupancy sensors.

Energy Use Index B3 Benchmark

The site Energy Use Index (EUI) for the building is 65 kBtu/sqft, which is 57% lower than the B3 Benchmark of 154 kBtu/sqft. The site EUIs for State of Minnesota buildings are 23% lower than their corresponding B3 Benchmarks on average. This shows Pine Technical College is performing significantly better than the average state building

Metering

The complex contains a total of six electric meters. Five of the electrical meters only report kWh usage from 100 to 3,000 kWh per month. The campus contains one main electrical meter which records the majority of the campus electric use. The campus also contains two gas meters. One of them is only associated with the gunsmithing lab and the other is the main gas meter which records the majority of the campus gas use.

Documentation

The building does contain mechanical plans for all major mechanical projects. They are not well organized, but due to the small size of the building, information is easy to find. There are also balance reports available if the equipment was balanced and control sequences for all equipment on the automation system. The boiler project also contains a commissioning report.

Additional Information form Occupants Interviews and Observations

The following information **has not been verified** and was obtained through occupant interviews and/or general observations by the PBEEEP Screening team. This information is provided for reference only:

- One HW pump was running at 92% and the other pump was off
- From the limited VAV boxes looked at, there wasn't a universal setpoint.
- AHU-1 Penthouse 2002 cannot meet duct static setpoint
- Assure heat wheels are being utilized in the RTUs.

Building Summary Table

The following tables are based on information gathered from interviews with facility staff, a building walk-through, automation system screen-captures, and equipment documentation. The purpose of the tables is to provide the size and quantity of equipment and the level of control present in each building. It is complete and accurate to the best of our knowledge.

Pine Technical College					
Area (sqft)	98,394	Year Built	1965-2001	EUI/Benchmark	65/154
HVAC Equipment					

Air Handlers (10 Total)

Description	Type	Size	Notes
AHU-1 2002	Variable air volume	20,600 CFM 30 HP SF 10 HP RF	
AHU-1 1988	Variable air volume	14,200 CFM 15 HP SF	
AHU-2 2002		7,465 CFM 7.5 HP SF	
AHU-2 1988	Variable air volume	8,620 CFM 10 HP SF	
AHU-3	Constant volume	5 HP SF	
AHU-4	Constant Volume Multi-zone unit	4,700 CFM 3 HP SF	
AHU-5	Constant volume	800 CFM 2 HP SF	
AHU-7	Variable air volume	6,800 CFM 7.5 HP SF 2 HP RF	Installed in 2008
AHU-8 (Science Lab 2006)	Variable air volume	3,530 CFM 5 HP SF 2 HP RF	Installed in 2006
AHU-9	Constant volume	Unknown design conditions	Installed in 2006
HRV-1	Air to air heat exchanger	800 CFM	Serves the front bathroom

HVAC Equipment Cont'd

Roof Top Units (3 Total)

Description	Type	Size	Notes
RTU-1	100% OA Energy Recovery	1,200 CFM 1 HP SF 1 HP EF	
RTU-2	100% OA Energy Recovery	1,200 CFM 1 HP SF 1 HP EF	
RTU-3	100% OA Energy Recovery	1,200 CFM 1 HP SF 1 HP EF	

Cabinet unit heaters and Unit heaters (11 Total)

Description	Type	Size	Notes
UH-1 through UH-10	Hot water	18 to 108 kBtu/hr	
CUH-1	Hot water	59 kBtu/hr	

Variable air volume boxes

Description	Type	Size	Notes
59 VAV boxes	Reheats	170 to 4005 CFM	From 2002

Exhaust fans (unknown number)

Description	Type	Size	Notes
EF	Constant volume	360 to 1,400 CFM	Size information is based off data found on equipment

Hot Water System

Description	Type	Size	Notes
Boiler-1 Boiler-2 Boiler-3	Hot Water	1,750 kBtu/hr	Installed in 2008
Boiler-4	Hot Water	930 kBtu/hr input	Installed in 2002
HWP-1 through HWP-2	Variable volume	7.5 HP 380 gpm	Installed in 2008
Domestic Hot Water HX			

HVAC Equipment Cont'd

Chilled Water System

Description	Type	Size	Notes
Chiller-1	Air cooled	140 tons	
Pump-1	Constant volume	5 HP 231 gpm	

MAU

Description	Type	Size	Notes
MAU-1	Variable air volume	14,000 CFM 10 HP SF	Serves the Automobile section

Points on BAS

Air Handlers

Description	Points
AHU-1 1988	Mixed air dampers, Economizer status, Filter pressure, MAT, Cooling available, Cooling stage 1, Supply fan command, Supply fan speed output, Effective DAT setpoint, DAT, Duct static pressure, Coldest zone temperature, RAT, Relief damper output %, Safety shutdown reset command, Economizer OA-T switch setpoint, Damper minimum position setpoint, Mixed air temperature low limit setpoint, Discharge air temperature setpoint, Discharge pressure setpoint, Cooling OA-T enable setpoint
AHU-2 1988	Mixed air dampers, Economizer status, MAT, Heating valve %, Cooling available, Cooling stage 1, Supply fan command, Supply fan speed output, DAT, Duct static pressure, Zone temperature, RAT, Relief damper output %, Economizer OA-T switch setpoint, Damper minimum position setpoint, Mixed air temperature setpoint, Discharge air temperature setpoint, Discharge static pressure setpoint, Cooling OA-T enable setpoint, Cooling stage 1 on % setpoint
AHU-3	Mixed air dampers, Economizer status, Filter pressure, MAT, Face/Bypass damper command, Cooling stage 1, Cooling stage 2, Cooling available, Heat valve %, Heating available, Supply fan command, DAT, Zone temperature, Occupied mode, RAT, Effective heating setpoint, Effective cooling setpoint, T stat Dial center position setpoint, Economizer OA-T switch setpoint, Damper minimum position setpoint, Face/Bypass OA-T switch setpoint, Heating OA-T enable setpoint, Cooling OA-T enable setpoint
AHU-4	Mixed air damper %, Economizer status, Filter pressure, MAT, Supply fan command, Cooling available, Cooling stage 1, Heat valve %, Hot deck temperature, Cold deck temperature, Relief damper output %, RAT, Economizer OA-T switch setpoint, Damper minimum position setpoint, Hot deck temperature setpoint, Cold deck temperature setpoint, Cooling OA-T enable setpoint
AHU-1 2002 AHU-2 2002	Mixed air dampers, Economizer status, MAT, Heat valve %, Cooling valve %, Cooling loop pump, Supply fan command, Supply fan speed output, Humidifier command, Humidifier output, DAT, Duct static pressure, Zone temperature, Zone static pressure, Economizer OA-T switch setpoint, Damper minimum position setpoint, DAT setpoint, Duct static pressure setpoint, Cooling OA-T enable setpoint, Cooling lockout status, Cooling loop pump OA-T enable setpoint, Humidifier OA-T enable setpoint
AHU-7	Mixed air damper, Outdoor airflow, Calculated outdoor airflow, MAT, Filter pressure, Cooling stage 1, Cooing stage 2, Cooling available, Cooling coil DAT, Heat valve %, Supply fan command, Supply fan speed output, Effective DAT setpoint, DAT, Duct static pressure, Zone static pressure, Zone temperature, Return air temperature, Return air CO2, Relief fan speed output, Relief fan command, Relief damper output., Economizer status, Calculated damper minimum position setpoint, Winter discharge air temperature setpoint, Duct static pressure setpoint, zone static pressure setpoint, Heating OA-t enable setpoint, Cooling OA-T enable setpoint

Points on BAS Cont'd

Air Handlers

Description	Points
AHU-8	Mixed air damper %, Economizer status, MAT, Heating valve %, Filter pressure, Heating coil DAT, Cooling lockout status, Cooling stage 1, Cooling stage 2, Supply fan command, Supply fan speed output, Actual DAT setpoint, DAT, Duct static pressure, Zone temperature, Zone static pressure, Return fan command, Return fan speed output, RAT, Economizer OA-T switch setpoint, Damper minimum position setpoint, Heating loop pump OA-T enable setpoint, Duct static pressure setpoint, Cooling OA-T enable setpoint, Cooling stage 1 On % setpoint Zone static pressure setpoint
AHU-9	Damper position, Face/Bypass damper %, Heat coil loop pump status, Low temperature alarm, Supply fan command, DAT, DAT setpoint, Heating loop OA-T enable setpoint

Roof Top Units

Description	Points
RTU-1 RTU-2 RTU-3	OARH, Economizer status, Damper command, MAT, Cooling lockout status, Cooling stage 1, SF command, Heat valve %, DAT, Zone temperature, RAT, RARH, Zone temperature setpoint, Mixed air temperature setpoint, Economizer OA-T switch setpoint, Damper minimum position setpoint, Cooling OA-T enable setpoint, Cooling stage 1 on % setpoint,

Hot Water System

Description	Points
System	Call from Fulton panel, Enable from JCI, Boiler 1 HWS-T, Boiler 2 HWS-T, Boiler 3 HWS-T, Bypass valve command, Bypass valve status, HWS-T, HWR-T, HWP-1 command, HWP-1 output %, HWP-2 command, HWP-2 output %, Hot water differential pressure, Boiler 4 enable, Boiler 4 command, Actual hot water supply setpoint, Hot water pumps reset command, Hot water differential pressure setpoint

Domestic Hot Water Systems

Description	Points
System	Domestic hot water pump command, Domestic hot water supply temperature, Domestic hot water valve output %, Domestic hot water temperature setpoint

HRV unit (1 total)

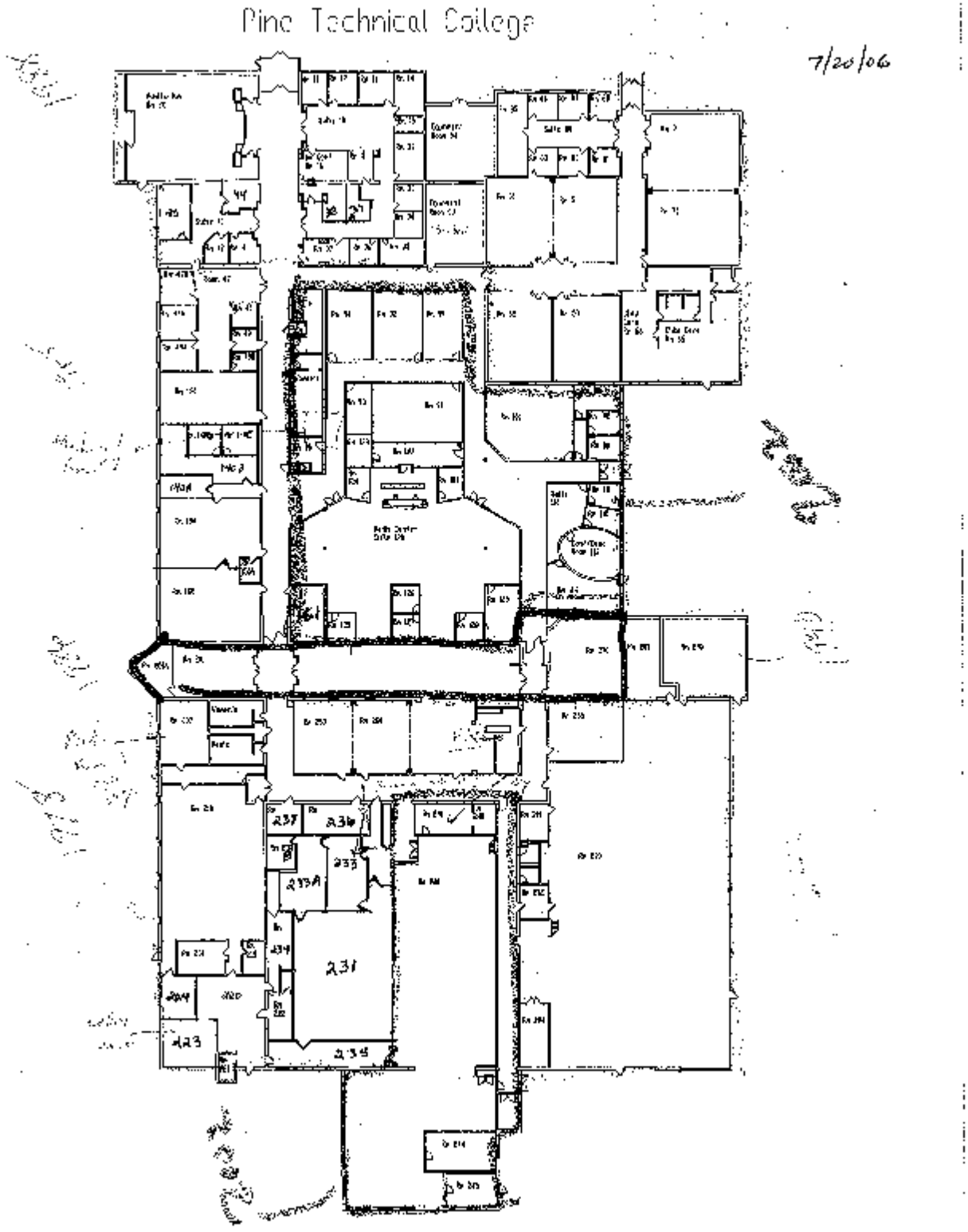
Description	Points
HRV-1	Run command, RAT, Heat valve %

Points on BAS Cont'd

VAV boxes (59 total)

Description	Points
VAVs	Supply air flow, Supply air flow setpoint, Damper position, Heating output %, Zone temperature, Zone common setpoint, Actual heating setpoint, Actual cooling setpoint, Occupied heating bias, Occupied cooling bias

Building Floor Plans



PBEEEP Abbreviation Descriptions			
AHU	Air Handling Unit	HUH	Horizontal Unit Heater
BAS	Building Automation System	HRU	Heat Recovery Unit
CD	Cold Deck	HW	Hot Water
CDW	Condenser Water	HWDP	Hot Water Differential Pressure
CDWRT	Condenser Water Return Temperature	HWP	Hot Water Pump
CDWST	Condenser Water Supply Temperature	HWRT	Hot Water Return Temperature
CFM	Cubic Feet per Minute	HWST	Hot Water Supply Temperature
CHW	Chilled Water	HX	Heat Exchanger
CHWRT	Chilled Water Return Temperature	kW	Kilowatt
CHWDP	Chilled Water Differential Pressure	kWh	Kilowatt-hour
CHWP	Chilled Water Pump	MA	Mixed Air
CHWST	Chilled Water Supply Temperature	MA Enth	Mixed Air Enthalpy
CRAC	Computer Room Air Conditioner	MARH	Mixed Air Relative Humidity
CUH	Cabinet Unit Heater	MAT	Mixed Air Temperature
CV	Constant Volume	MAU	Make-up Air Unit
DA	Discharge Air	OA	Outside Air
DA Enth	Discharge Air Enthalpy	OA Enth	Outside Air Enthalpy
DARH	Discharge Air Relative Humidity	OARH	Outside Air Relative Humidity
DAT	Discharge Air Temperature	OAT	Outside Air Temperature
DDC	Direct Digital Control	Occ	Occupied
DP	Differential Pressure	PTAC	Packaged Terminal Air Conditioner
DSP	Duct Static Pressure	RA	Return Air
DX	Direct Expansion	RA Enth	Return Air Enthalpy
EA	Exhaust Air	RARH	Return Air Relative Humidity
EAT	Exhaust Air Temperature	RAT	Return Air Temperature
Econ	Economizer	RF	Return Fan
EF	Exhaust Fan	RH	Relative Humidity
Enth	Enthalpy	RTU	Rooftop Unit
ERU	Energy Recovery Unit	SF	Supply Fan
FCU	Fan Coil Unit	Unocc	Unoccupied
FPVAV	Fan Powered VAV	UH	Unit Heater
FTR	Fin Tube Radiation	VAV	Variable Air Volume
GPM	Gallons per Minute	VFD	Variable Frequency Drive
HD	Hot Deck	VIGV	Variable Inlet Guide Vanes
HP	Horsepower	VUH	Vertical Unit Heater

Conversions
1 kWh = 3.412 kBtu
1 Therm = 100 kBtu
1 kBtu/hr = 1 MBH